

## Professional Biography

Tore Straume, Ph.D.



Dr. Straume has held senior scientist and academic positions at the Lawrence Livermore National Lab (1975 – 1997), the University of Utah (1997 – 2004), and the NASA Ames Research Center (2004 – present). Although his core expertise is radiation science applied to radiobiology, biophysics, and novel radiation detection technologies, he has also pioneered the development of biotechnologies and is inventor or co-inventor of nine patents in the biotechnology field.

Dr. Straume received a PhD in biophysics from the University of California in 1982 and a BS and MS from the University of Washington (1973, 1976). He also performed course work and received a certificate in Risk Analysis in Occupational and Environmental Health in 1989 from Harvard University. Dr. Straume's present position at NASA includes advancing our understanding of health effects from radiation exposure during deep space exploration missions such as Mars and the development of methods and technologies to mitigate such hazards.

Prior to accepting a position at NASA in 2004, Dr. Straume was perhaps best known for his groundbreaking work to help resolve a decades-old debate concerning the radiation doses received by A-bomb survivors in Hiroshima and Nagasaki. The significance of this work is underscored by the fact that the A-bomb data serve as the principal basis for radiation risk estimation in humans, both here on Earth and in space. Dr. Straume and his team developed novel analytical methods that

permitted the quantification of trace signatures produced by the atomic bomb neutrons more than half a century previously. The results were incorporated into a new system for estimating radiation dose in Hiroshima and Nagasaki, known as DS02 (Dosimetry System 2002). This was a landmark international study that reassessed radiation levels in the Japanese cities destroyed by atomic bombs at the end of World War II. In 2006, the U.S. Department of Energy conferred its Special Achievement Award upon Dr. Straume and lauded his work as "essential to our understanding of the health effects of radiation exposure". The research is a "tour de force experimentally" commented Dr. Warren K. Sinclair, past president of the National Council on Radiation Protection and Measurements and Chairman of the NAS committee overseeing the work. This work resulted in a large number of publications, including the cover article in the July 31, 2003, issue of *Nature*: [\*Measuring fast neutrons in Hiroshima at distances relevant to atomic-bomb survivors.\*](#) Also, associated remarks on the paper in News and Views of the same issue: [\*Radiation: A dose of the bomb.\*](#)

While at Livermore, Dr. Straume also co-developed the "chromosome painting" technology (generally referred to as FISH) with Drs. Joe Gray and Dan Pinkel. The first "chromosome painting" paper entitled [\*Cytogenetic analysis using quantitative, high-sensitivity, fluorescence hybridization\*](#) was Pinkel, Straume, and Gray in the Proceedings of the National Academy of Sciences in 1986. Dr. Straume together with Dr. Joe Lucas and colleagues at Livermore continued to advance and validate the technology for applications in biological dosimetry, risk assessment, and cancer diagnostics. In the mid 1990's, they transferred the FISH technology from LLNL to NASA and today FISH biodosimetry is routinely used to assess radiation exposures of astronauts that spend more than three months on the International Space Station, and will likely be part of any biodosimetry approach for future deep space missions, including Mars.

During the early years at Livermore, Dr. Straume advanced his radiation science career by performing research focused on the relative biological effectiveness (RBE) of low-dose neutron radiation, experience that is particularly relevant to human space exploration where neutron exposure is a major concern. This research began in the Reproductive Biology Section of the Biomedical Sciences Division at Livermore under the outstanding direction of Dr. R. Lowry Dobson who also served as Dr. Straume's Ph.D. thesis supervisor. Dr. Dobson pioneered the hypersensitivity of resting oocytes to low-dose-rate tritium beta rays and clastogenic chemicals in juvenile mice and discovered that this hypersensitivity was also observed in non-human primates, but in that case when exposed prior to birth. These findings strongly suggested that such hypersensitivity may also exist in women if exposed during the second half of pregnancy. Dr. Straume's reproductive biology research continued with experiments at the Berkeley Bevatron using the space-relevant heavy ions Si, Ar, and Fe, and followed by a collaboration with Dr. Lynn Wiley of UC Davis which resulted in the first observation that a male mouse exposed to very low doses of radiation can pass on detrimental effects not only to the first generation, but also to the second and third.

In 1997, Dr. Straume accepted a professorship at the University of Utah, where he completed the Hiroshima effort and became Director and Principal Investigator of the Center of Excellence for Biomolecular Technologies. Three patents resulted from this work. While at Utah, Dr. Straume also started a small technology company (GenMetrix LLC) with SBIR support from NIH. GenMetrix collaborated with Myriad Genetics Laboratories to evaluate the potential utility of the GenMetrix technology in the detection of selected interstitial deletions in BRAC genes known to be important indicators of future breast cancer risk in women with inherited predisposition to breast and ovarian cancer.

In 2004, Dr. Straume accepted a position at the NASA Ames Research Center and in 2005 became Chief Scientist for the Life Sciences Division. In 2006 he founded a new branch at NASA Ames called Radiation and Space Biotechnologies, which he managed as Branch Chief until 2011. Dr. Straume's research and experience continues to help the agency with special emphasis on the vexing challenges associated with radiation and human space travel. Click here to read the article from the 2010 Journal of Cosmology: [\*Radiation Hazards and the Colonization of Mars: Brain, Body, Pregnancy, In-Utero Development, Cardio, Cancer, Degeneration\*](#)

Dr. Straume's outside interests include the development of information and technologies to help autistic kids.